



# A system-level computational model of decision-making and learning in the lateral and medial sub-regions of Orbitofrontal Cortex

Bhargav Teja Nallapu, Frédéric Alexandre

## ► To cite this version:

Bhargav Teja Nallapu, Frédéric Alexandre. A system-level computational model of decision-making and learning in the lateral and medial sub-regions of Orbitofrontal Cortex. OFC 2019: Fourth Quadrennial Meeting on OFC Function, Nov 2019, Paris, France. hal-02417618

**HAL Id: hal-02417618**

**<https://inria.hal.science/hal-02417618>**

Submitted on 18 Dec 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# A system-level computational model of decision-making and learning in the lateral and medial sub-regions of Orbitofrontal Cortex

Bhargav Teja Nallapu, Frederic Alexandre  
bhargav.teja-nallapu@inria.fr

INRIA, Institute of Neurodegenerative Diseases, LaBRI Bordeaux

## Abstract

### Orbitofrontal Cortex

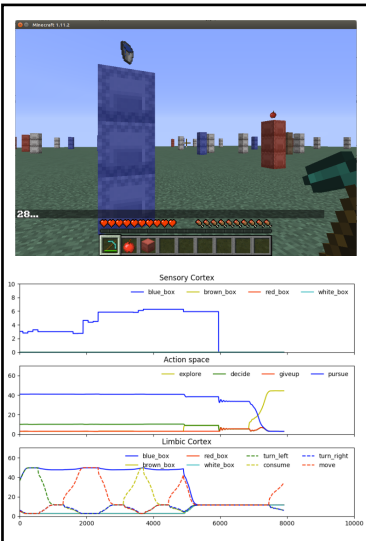
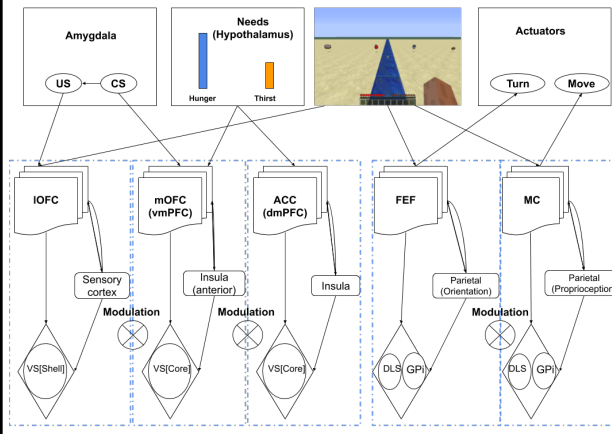
Flexible and adaptive animal behavior through value-based decision making and learning

Pavlovian valuation with basolateral amygdala (BLA)

Instrumental valuation with Anterior Cingulate Cortex (ACC) and Ventral Striatum (VS)

Closed-loop dynamics with the Basal Ganglia (BG) and the Thalamus - Limbic (CtxBG) Loops

### Limbic and sensori-motor loop interactions (Krack et al., 2010)

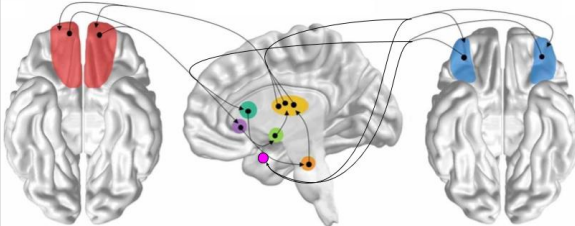


### Lateral

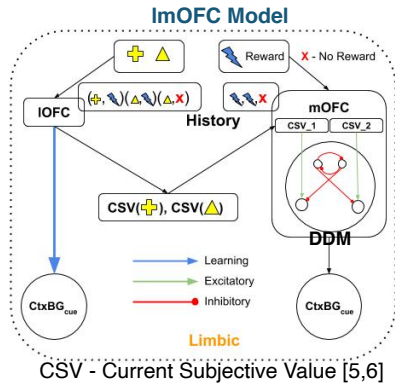
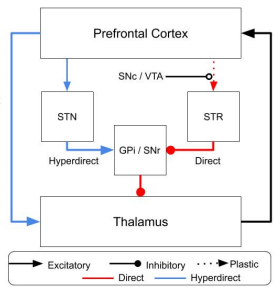
### Medial

Projections from Sensory areas and Amygdala	Projections from visceral areas like Lateral Hypothalamus
External features [1]	Internal motivation[1]
Outcome Identity[2]	Outcome Value[3]
After feedback[1]	Before feedback[1]
Credit Assignment[3]	Value Comparison[4]

### Medial and Lateral Thalamo-BG closed-loop connectivity (Fettes et al., 2017)



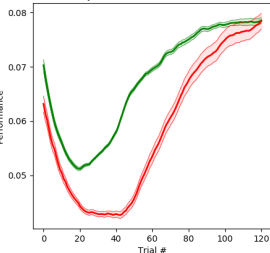
### CtxBG (Boraud et al., 2018)



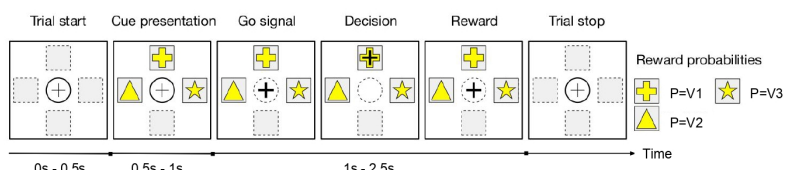
### ImOFC Model

### CtxBG Model

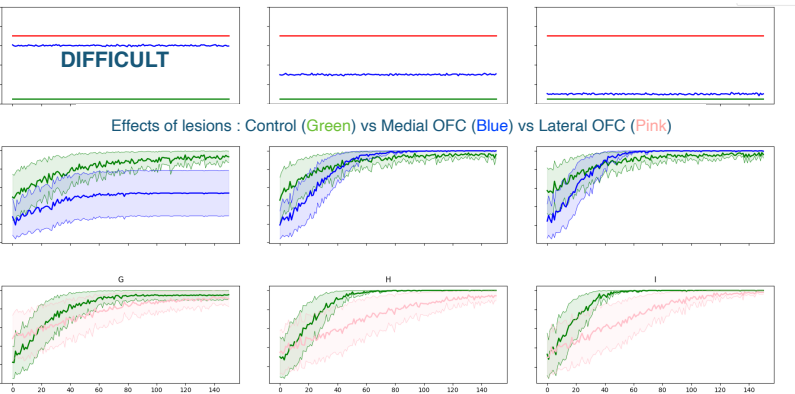
### Value Difference



### 3-Arm Bandit Task



### Reward Schedules : V1 - Red, V2 - Blue, V3 - Green



### Hypotheses : Medial vs Lateral OFC

- Value prediction vs State prediction
- Task beginning vs Task ending
- Model-Free vs Model-Based

### References

- [1] Bouret et al., 2010
- [2] Walton et al., 2010
- [3] Noonan et al., 2010
- [4] Hunt et al., 2012
- [5] Bissonette et al., 2013, [6] Grossberg 2018

Inria  
inventeurs du monde numérique

IMN  
BORDEAUX  
neurocampus

LaBRI